

Appendix N: Noise Impact Analysis

NOISE IMPACT ANALYSIS

**Proposed
Power Generating Facility
3497 Main Street
Chula Vista, California**

**Prepared for
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1.0 EXECUTIVE SUMMARY

The proposed project is a commercial power generation system using Pratt & Whitney combustion turbines engines with auxiliary equipment to produce 49.5 MW of electricity. This generation system is not intended for continuous online use. It is only intended to provide power during occasional high peak electrical demands. Development of this plant will provide additional power to the electrical grid during periods of high peak electrical demand.

Without mitigation, onsite noise levels would be in excess of allowable levels. There will be noise impacts to the surrounding area from the operation of this generating system. With implementation of noise mitigation as described in this report, the noise from all sources in the proposed Power Generating Facility can be reduced to levels that comply with the noise regulations of the City of Chula Vista and the Chula Vista Mscp Sub Area Plan guidelines, and the United States Fish and Wildlife Service guidelines.

2.0 INTRODUCTION

This study is a preliminary noise impact analysis of the proposed PG&E Power Generating Facility, at 3497 Main Street in Chula Vista. The site is physically located approximately 835 feet to the south of the junction of main street and Albany Street. The north, east and west property lines are coterminous with the adjacent industrial and commercially developed properties which front Main Street. These properties are zoned for industrial use. The south property line is at the City of San Diego General Plan designated Open Space Area (flood plain fringe of the Otay River).

The site consists of one Assessor's Parcel, Number 629-062-04-00.

2.1 Project Description

Though infrequent, power utilization tends to dramatically increase on hot summer days in July through September, when both industrial and residential air conditioning loads reach their peaks at simultaneous times. These times of sharply increased power utilization are commonly referred to as “needle” peak loads.

The proposed project is a single unitized commercial power generation system. This system is developed with a “twin pak” turbine system using two Pratt & Whitney combustion engines linked to a common power turbine which drives an air cooled generator. This unit is intended to provide electrical power to the power grid during “needle” peak load times.

This plant is not intended for continuous long term use and will only be operated during these “needle” peak conditions.

The power plant will include a high pressure natural gas compressor for the fuel system, auxiliary equipment for emissions control, several high volume air blowers, air conditioning, and electrical control systems. There is an intake for each of the two combustion engines, and a single turbine exhaust. This facility will have the capacity to produce a maximum of 49.5 MW of electrical power.

2.2 General Site Characteristics

The subject property is rectangular in shape and is bounded on three sides by previously developed property. The land immediately north of Main Street is developed with residential and commercial enterprises, and that south of Main Street is commercial and industrial uses.

According to City of Chula Vista Planning Department, the current zoning for subject property is I.L.P. (Light Industrial Specific Plan). The Chula Vista General Plan designates the site as limited industrial. The general project area is within the Montgomery Community Planning area, which was annexed to the City of Chula Vista in recent years. In addition to the general plan, the Montgomery Specific Plan is a specific plan for the subject area and provides a more specific definition of the allowable land uses in the area. The specific plan designates the subject property for limited industrial use.

To the south is the Otay River Valley an area designated as habitat preserve by the Chula Vista Multiple Species Conservation Plan (MSCP).

2.3 Similar Site Investigation

As part of the general study, a similar generation station (under 50 MW) was visited in Escondido. This site was located on Tulip Street, just east of the I-15 freeway and one block north of Valley Parkway. This facility is contained within a twenty foot high noise control and security wall. Access to the inside of the facility was not available; however, a gap was left in the wall next to a gate and a Calibrated Class 1 noise measurement instrument was used to take overall noise data.

Noise measurements were taken outside and just inside the facility on Monday, May 15, 2000 at 6 p.m. At a distance of 15 feet outside the facility, a measurement of 57.3 dB(A) was recorded. Through the gap on the inside, 75.4 dB(A) was recorded.

3.0 ENVIRONMENTAL SETTING

3.1 Existing Noise Environment

This property is currently subject to noise from traffic on the nearby Main Street and noise from nearby industrial uses including auto and scrap metal recycling.

The current 65 Community Noise Equivalent Level (CNEL) contour is approximately 250 feet from the centerline of Main Street and the 60 CNEL contour is 550 feet from the Centerline. The current (1997 count) Average Daily Trips (ADT) for this section of Main Street is 18,220.

3.2 Future Noise Environment

The future noise environment will include increased traffic noise from Main Street and the probable development of a light industrial park to the west. This land (to the west) is currently vacant but is available for industrial development.

The future 65 Community Noise Equivalent Level (CNEL) contour is approximately 400 feet from the centerline of Main Street and the 60 CNEL contour is 750 feet from the Centerline. The projected traffic build out forecast ADT for this section of Main Street is 32,000. Traffic noise contours are shown in the figures.

4.0 METHODOLOGY

Field Measurement

Typically, a one-hour equivalent sound level measurement (L_{eq} , A-Weighted) is recorded for at least one noise-sensitive location on the site. During the noise measurement, start and end times are recorded, vehicle counts are made for cars, medium trucks (double-tires/two axles), and heavy trucks (three or more axles) for the corresponding road segment. Supplemental sound measurements of one hour or less in duration are often made to further describe the noise environment of the site. For measurements of less than one hour duration, the measurement time is long enough for a representative traffic volume to occur, and the noise level (L_{eq}) to stabilize; 15 minutes is usually sufficient. The vehicle counts are then converted to one-hour equivalent volumes by using the appropriate multiplier.

Other field data gathered includes measuring or estimating distances, angles-of-view, slopes, elevations, roadway grades, and vehicle speeds. These data were checked against the available maps and records.

The primary focus for this study is noise from the proposed project: therefore, only computer modeling was used for the traffic noise contour development.

Roadway Noise Calculations

The *SOUND 32* Release 1.41 program promulgated by California Department of Transportation, Division of New Technology, Materials and Research was used to calculate the future daytime average hourly noise level, HNL, at various locations at the project site. The daytime average hourly traffic volume is calculated as 0.058 times the ADT, based on the studies made by Wyle Laboratories (see Reference). The HNL is equivalent to the L_{eq} , and both are converted to the CNEL by adding 2.0 decibels, as shown in the Wyle Study. Future CNEL is calculated for desired receptor locations using future road alignment, elevations, lane configurations, projected traffic volumes, estimated truck mixes, and vehicle speeds. Noise attenuation methods may be analyzed, tested and planned with *SOUND32* as required.

Equipment

The following equipment was used during the Similar Site Investigation to measure existing noise levels:

- Larson Davis Model 824 with simultaneous 1/3 octave data analysis and FFT capability
- Tripod and tape measure
- Sony Video Camera

5.0 DEFINITIONS

- a. A-Weighted Sound Levels: Decibels (referenced to 20 micro-Pascal) as measured with A-weighting network of standard sound level meter, abbreviated dB(A).
- b. Background Noise: Shall be defined as the measured ambient noise level associated with all existing environmental, transportation, and community noise sources in the absence of any audible construction activity.
- c. Construction Site: For purposes of noise and vibration control requirements, the Contract limits of construction. This includes Right-of-Way lines, property lines, construction Easement Boundary or property lines and Contractor staging areas outside the defined boundary lines, used expressly for construction.
- d. Daytime: The period from 7:00 a.m. to 10:00 p.m. seven days per week.
- e. L_{Eq} : Shall be defined as the equivalent sound level, or the continuous sound level that represents the same sound energy as the varying sound levels, over a specified monitoring period.
- f. L_{MAX} : The RMS value of the period measurement peak noise level.
- g. Nighttime: Periods other than daytime (as defined above), and including Sundays and legal holidays.
- h. Noise: Any audible sound which has the potential to annoy or disturb humans, or to cause an adverse psychological or physiological effect on humans.
- i. Noise Level Measurements: Unless otherwise indicated, the use of A-weighted and "slow" response of instrument complying with at least Type 2 requirements of latest revision of American National Standard Institute (ANSI) S1.4. Specification for Sound Level Meters.
- j. Noise-Sensitive Location: Shall mean locations where particular sensitivities to noise exist, such as residential areas, institutions, hospitals, parks, or other environmentally sensitive areas.
- k. Octave Filtered and 1/3 Octave Filtered data: A contiguous series of continuous sound spectra centered about the stated frequency with half of the bandwidth above and half below the stated frequency. This data is used for machinery noise analysis and barrier effectiveness calculations.
- l. Sound Transmission Class (STC): A single number rating calculated in accordance with ASTM E413 using values of sound transmission loss. It provides an estimate of the performance of a partition in certain common sound insulation problems.
- m. Vibration: Velocity in microinches per second. Vibration levels are expressed as velocity levels in decibels referenced to one microinch per second, abbreviated VdB.
- n. δ : The sound path length difference from direct line-of-sight from the source to the receiver and the indirect path over a barrier.

6.0 SYNOPSIS OF GOVERNING REGULATIONS AND APPLICABILITY OF ALLOWABLE SOUND LEVELS OF TOTAL SITE NOISE:

Several different noise regulations, apply:

- City of Chula Vista Noise Ordinance
- City of Chula Vista Noise Element to the General Plan
- City of Chula Vista MSCP
- City of San Diego Noise Ordinance

6.1 City of Chula Vista Noise Ordinance

The City of Chula Vista Noise Ordinance specifies exterior noise level limits for receiving land use categories and interior noise limits for residential properties. These regulations are summarized below in Table III (City Ordinance).

Applicable Excerpts from the Chula Vista Noise Ordinance:

19.68.030 Exterior Noise Limits.

A. Maximum permissible sound levels by receiving land use.

1. The noise standards for the various categories of land use as presented in Table III and set forth in terms defined in the city land use code set forth in Chapter 19.04, shall, unless otherwise specifically indicated, apply to each property or portion of property substantially used for a particular type of land use reasonably similar to the land use types shown in Table III. Where two or more dissimilar land uses occur on a single property, the more restrictive noise limits shall apply.

4. No person shall operate or cause to be operated, any source of sound at any location within the city or allow the creation of any noise on property owned, leased, occupied or otherwise controlled by such person, which causes the noise level to exceed the environmental and/ or nuisance interpretation of the applicable limits given in Table III.

B. Correction to exterior noise level limits.

3. In the event the alleged offensive noise, as judged by the enforcement officer, contains a steady audible sound such as a whine, screech, or hum, or contains repetitive impulsive noise such as hammering or riveting, the standard set forth in Table III shall be reduced by 5 dB.

Table 1. City of Chula Vista Ordinance, Chapter 19.04, ^a Exterior Noise Limits ^{1,2}		
1. Environmental Noise - L_{EQ} in any hour. 2. Nuisance Noise - Not to be exceeded at any time.	Noise Level [dB(A)]	Noise Level [dB(A)]
	10 p.m. to 7 a.m. (Weekdays)	7 a.m. to 10 p.m. (Weekdays)
	10 p.m. to 8 a.m. (Weekends)	8 a.m. to 10 p.m. (Weekends)
All residential (except multiple dwelling)	45	55
Multiple dwelling residential	50	60
Commercial	60	65
Light Industry - I-R and I-L Zone	70	70
Heavy Industry - I Zone	80	80

^a TABLE III of City of Chula Vista Ordinance

(Ord. 2276 2, 1988; Ord. 2101 3 (part), 1985).

The Chula Vista Noise Ordinance specifies exterior noise level limits for receiving land use categories. The land use for subject property is commercial, and the zoning is for Limited Industrial with Precise Plan Overlay (ILP).

The land use for subject property is Light Industrial (I-L), which has a noise limit of 70 dB for noise generation, 24 hours per day at the subject property line. This would apply to any similar land uses adjacent to the project site.

The adjacent properties to the west, north and east are industrial and have property line noise limits of 70 dB(A).

The nearest residential land use is the second property to the west and is zoned residential. Therefore, the more restrictive single family residential standards are applicable.

As shown in Table III of the Chula Vista Noise Ordinance, the residential land uses are the most sensitive. For the residential areas, except multi-family, the noise limits specified are 45 dB at night (10 p.m. to 7 a.m. weekdays and 10 p.m. to 8 a.m. weekends) and 55 dB during the daytime.

Therefore, this project cannot create more than an hourly average of 40 dB(A) L_{EQ} during the hours of 10 p.m. to 7 a.m. at the single family residence(s) to the north and west. The 40 dB(A) is the 45 dB(A) L_{EQ} less the 5 dB(A) L_{EQ} penalty for a constant noise source.

The nearest single family home to the west is at a distance of approximately 380 feet from the subject property. The nearest home to the north is approximately 450 feet.

Therefore, 40 dB(A) at 380 feet from the subject property will be used as a basis for noise planning to meet the regulations of the City of Chula Vista. This provides an approximate property line limit for the subject property of 56 to 60 dB(A) L_{EQ} assuming no intervening structures acting as barriers.

19.68.040 Interior Noise Standards

The Chula Vista Noise Ordinance also specifies interior noise level limits for adjacent or nearby residential units, from noise created at another property. These limits are found in the following Table 2:

Table 2. Residential Interior Noise Limits ^b			
Time period	Maximum noise level (dBA)		
	Any time	1 min/hour	5 min/hour
Night (10 p.m. to 7 a.m.)	45	40	35
Day (7 a.m. to 10 p.m.)	55	50	45

^b Table IV of the Chula Vista Noise Ordinance

6.2 City of Chula Vista Noise Element to the General Plan

Policies (excerpts):

- Act to ensure the comfort, convince, and safety of its residences are not adversely affected noise.
- Endeavor to control noise at its source rather than along its path of transmission or by insulating the receiver.
- Take all possible steps to promote a quiet community.

Implementation Plan (excerpts):

- Continue to prohibit excessive noises which are a detriment to the health and safety of its residents.

- Continue to regulate noise in residential and commercial areas through the use of general noise ordinances.
- Continue to actively support noise legislation which will enhance our noise environment, reducing noise emissions from transportation, industrial, and construction sources.

Conclusion

The plan for the implementation of the Noise Element will require the strict enforcement of Chula Vista's existing noise control ordinances, and the City Council's enactment of new legislation, when and where such is indicated. The environmental review process must continue its assessment of the impact of noise upon the order, stability, and quality of life in this municipality and its sphere of influence, and shall recommend legislative and administrative action to bring Council noise policy to fruition.

6.3 City of Chula Vista MSCP

Chula Vista MSCP sub area plan guidelines developed from the United States Fish and Wildlife Service guidelines which require that project noise shall be controlled to a level not to exceed 60 dB(A) L_{EQ} , or ambient average noise level (whichever is greater) at the edge of the occupied California gnatcatcher habitat closest to the project.

Other endangered species have similar guidelines. Therefore, the southern property line must have a maximum noise of 60 dB(A) L_{EQ} to meet the guidelines, since the adjacent area includes wildlife habitat for endangered species.

6.4 City of San Diego Noise Ordinance

Applicable Excerpts from the City of San Diego Municipal Code.

The City of San Diego Municipal Code, Section 59.5.0401 for Sound Level Limits states "It shall be unlawful for any person to cause noise by any means to the extent that the one-hour average sound level exceeds the applicable limit given in the following table, at any location in the City of San Diego on or beyond the boundaries of the property on which the noise is produced. The noise subject to these limits is that part of the total noise at the specified location that is due solely to the action of said person." Please refer to: City of San Diego Applicable Noise Limits for further evaluation.

Table 3. City of San Diego Table of Applicable Limits ^c		
Land Use Zone	Time of Day	One-Hour Average Sound Level
Residential All R-1	7 a.m to 7 p.m.	50
	7 p.m. to 10 p.m.	45
	10 p.m. to 7 a. m.	40
Residential All R-2	7 a.m to 7 p.m.	55
	7 p.m. to 10 p.m.	50
	10 p.m. to 7 a. m.	45
Residential R-3, R-4 and all other Residential	7 a.m to 7 p.m.	60
	7 p.m. to 10 p.m.	55
	10 p.m. to 7 a. m.	50
All Commercial	7 a.m to 7 p.m.	65
	7 p.m. to 10 p.m.	60
	10 p.m. to 7 a. m.	60
All Manufacturing	Any time	75

^c Table 10. City of San Diego Table of Applicable Limits

The nearest single family home to the south is at a distance of approximately 1300 feet.

To achieve 40 dB(A) or less at this residence requires an approximate property line noise level limit for the subject property of 66 to 70 dB(A) L_{EQ} assuming no intervening structures acting as barriers to achieve a noise level not to exceed 40 dB(A) L_{EQ} , at the nearest residence to the south. Therefore, the City of San Diego Regulations do not need further consideration.

7.0 IMPACTS

7.1 Potential Noise Sources

Noise sources associated with the proposed project can be identified within three categories:

- a. Construction noise
- b. Stationary mechanical equipment operation
- c. Mobile noise sources, generally consisting of noise from cars and trucks.

7.2 Description of Noise Sources

Construction noise

The Chula Vista Municipal Code exempts construction and demolition activities from its exterior noise level limitations. However, most municipalities consider construction activities on Sunday or Nighttime as intrusive. Construction noise will usually exceed typical background noise levels but will generally be for a short term and will generally occur during daytime hours on weekdays and Saturdays. A table provided in the figures gives typical construction activities noise levels.

Stationary mechanical equipment operation

Noise from the stationary mechanical equipment will come from five dominant sources:

- The two separate engine air intakes and single turbine exhaust. Full acoustic data is not currently available for these engines; however, initial engineering estimates are for each of these three openings generate about 140 dB(A) directly at the opening.
- Direct noise radiation from the equipment, a currently unknown sound level. But estimated to be a maximum of 105 to 115 dB(A).
- High pressure reciprocating natural gas compressor, estimated to operate at 100 dB(A) at a distance of 10 feet from the unit. This is based on data taken at another natural gas compressors. Actual data will be supplied by the manufacturer at the time of unit specification.
- High volume air blower for generator cooling, Full acoustic data is not currently available for the generator however, initial engineering has estimated it to operate at 100 dB(A) at intake and exhaust openings.
- Absorption chillers and pumps to be located inside the enclosure. Sound data will be supplied by the manufacturer at the time of unit specification.

Mobile noise sources

Mobile noise sources after construction is complete will consist of operations and maintenance vehicles which will contribute negligible overall noise to the area and will not further be considered.

7.3 Conclusion

The stationary mechanical equipment could produce noise levels as high as 130 dB(A) at the property line if noise control measures are not included in the plant design. Precise noise data for each component in the plant is not available at this time because specific pieces of equipment to be installed have not been selected. Consequently, it is not possible to provide a final noise control system design at this time.

However, conventional noise reduction techniques that may be included in the plant design have noise reduction characteristic as shown in the following table.

Conventional Noise Reduction Techniques	
Technique	Noise Reduction
In Line Silencer	2 to 5 dB per foot
Louvers	10 to 20 dB per unit
Lined Right Angle Turns in Ducts	4 to 8 dB per turn
Lined Covers at Inlet/ Exhaust	4 to 8 dB (one per unit)
Noise Containment Walls	6 to 18 dB per unit

Note: The actual values of sound reduction are frequency dependent and unit dependent. These values are intended only as a rough overview of capabilities.

The noise produced by this plant can be reduced to less than significant levels (ie 60 dB(A)) through the implementation of the mitigation measures in the following section.

8.0 MITIGATION

8.1 Ongoing Operational Noise

As can be seen from the above table, 20 feet of silencer at 3 dB per foot (60 dB) plus two right angle turns (6 dB / turn), a louver (15 dB), and a cover (6 dB), altogether provide approximately 93 dB reduction in noise. Therefore, noise from each of two combustion engine inlets at 140 dB(A) should be reduced to 47 dB(A). While this is relatively quiet, it should be noted that if all of the individual noise generating components are summed after reduction to an equivalent level (6 known listed noise generating components), the sum of the noise would equal almost 57 dB(A). The above planning is not intended as a final description of mitigation measures for this project. The full mitigation analysis will include specific details including full frequency analysis for each system component.

Portions of the project require special consideration for the noise mitigation systems. These include:

- The 900 degree (Fahrenheit) system exhaust. This will require silencing systems designed to ensure ongoing system functionality.
- The high pressure natural gas compressor. Open air ventilation requirements are mandated by the State of California; these must be maintained by the noise quieting system.

The above brief look at conventional techniques does not explore the possibility of active noise cancellation. The technique of active noise cancellation through the use of computer controlled generation of an inverted noise signal is currently primarily used in smaller controlled situations such as ventilation fan noise. It should be noted that cost and reliability becomes an issue with active noise control applications as noise volumes increase. Its application was briefly explored as part of the overall noise control planning but due to economic and reliability issues with current technology it is not feasible for this project.

8.2 Recommended Measures

- a. Prior to the commencement of construction, an acoustical analysis of the final plant design shall be completed to the satisfaction of the City of Chula Vista. The analysis shall be based on the manufacturer's data or engineering estimates for major noise generating sources (engine air intakes, turbine exhaust, high pressure natural gas compressor, high volume air blower, absorption chillers, pumps, and direct equipment noise radiation). The analysis will document project features that will achieve 60 dB(A) at the property line.

- b. Acoustical tests of the plant shall be completed as soon as practical during the construction period. Additional noise control measures shall be implemented if the measured sound levels at the property line exceed 60 dB(A). Noise monitoring procedures are as follows:
- Acoustical consultant will utilize a Type I (Precision) or Type 2 (General Purpose) Sound Level Meter meeting the requirements of the latest revision of American National Standard Institute (ANSI) S1.4. Specification for Sound Level Meters.
 - Use calibrated sound level meters, microphones, and calibrators with certified laboratory conformance per the manufactures specifications.
 - Acoustical instruments should be field calibrated according to the manufacturer's specifications, prior to and following use.
 - All measurements will use the A-weighting network and the SLOW response of the sound level meter unless otherwise specified.
 - Impulsive or impact noises will be measured using the C-Weighting network and the FAST response of the sound level meter.
 - All measurement microphones will be fitted with an appropriate windscreen, and measurements will be taken at least six feet away from the nearest reflective surface.
 - Noise level measurement periods for intermittent noise shall be a minimum of 15 minutes.
 - If, in the estimation of the consultant, outside noise sources contribute significantly to the measured noise level, the measurements will be repeated with the same outside source contributions when construction is inactive to determine the background noise level.
 - Noise monitoring locations will be clearly identified on a drawing.
- c. Final acoustical tests of the plant shall be conducted upon the completion of construction. If the noise level at the property line exceeds 60 dB(A), plant operations shall cease and the plant design shall be modified to achieve the required level of noise reduction. In this case a new acoustical analysis shall be prepared.

- d. A Noise Monitoring Report shall be submitted to the City of Chula Vista upon completion of the acoustical test. The noise measurement reports shall include:
- Date
 - Time
 - Location
 - Duration of measurement
 - Instrument
 - Calibration
 - dB(A) L_{EQ}
 - Notes
 - Name of acoustician
- e. As stated in the Biology Report construction noise may require a noise control plan and monitoring if construction occurs during the period of February 15th through August 15th during any calendar year, to protect sensitive species. Further, according to common practice, construction activities should be limited to daylight hours Monday through Saturday.
- f. All construction equipment should be maintained in good condition with factory installed or equivalent noise control systems.

9.0 CONCLUSIONS

With implementation of noise mitigation as described above, noise from all sources in the project can be controlled to levels in compliance with the noise regulations of the City of Chula Vista and the United States of Fish and Wildlife Service guidelines .


The similar facility in Escondido provides an example of how this type of facility can be built in compliance with the applicable noise regulations.


10.0 CERTIFICATION

The findings and recommendations of this acoustical analysis report are a true and factual analysis of the potential environmental effects associated with the proposed development. This report was prepared by Charles Terry and Douglas K. Eilar.

Sincerely,

DOUGLAS EILAR & ASSOCIATES


Charles Terry, Mechanical Engineer
Consultant in Acoustics, Investigator

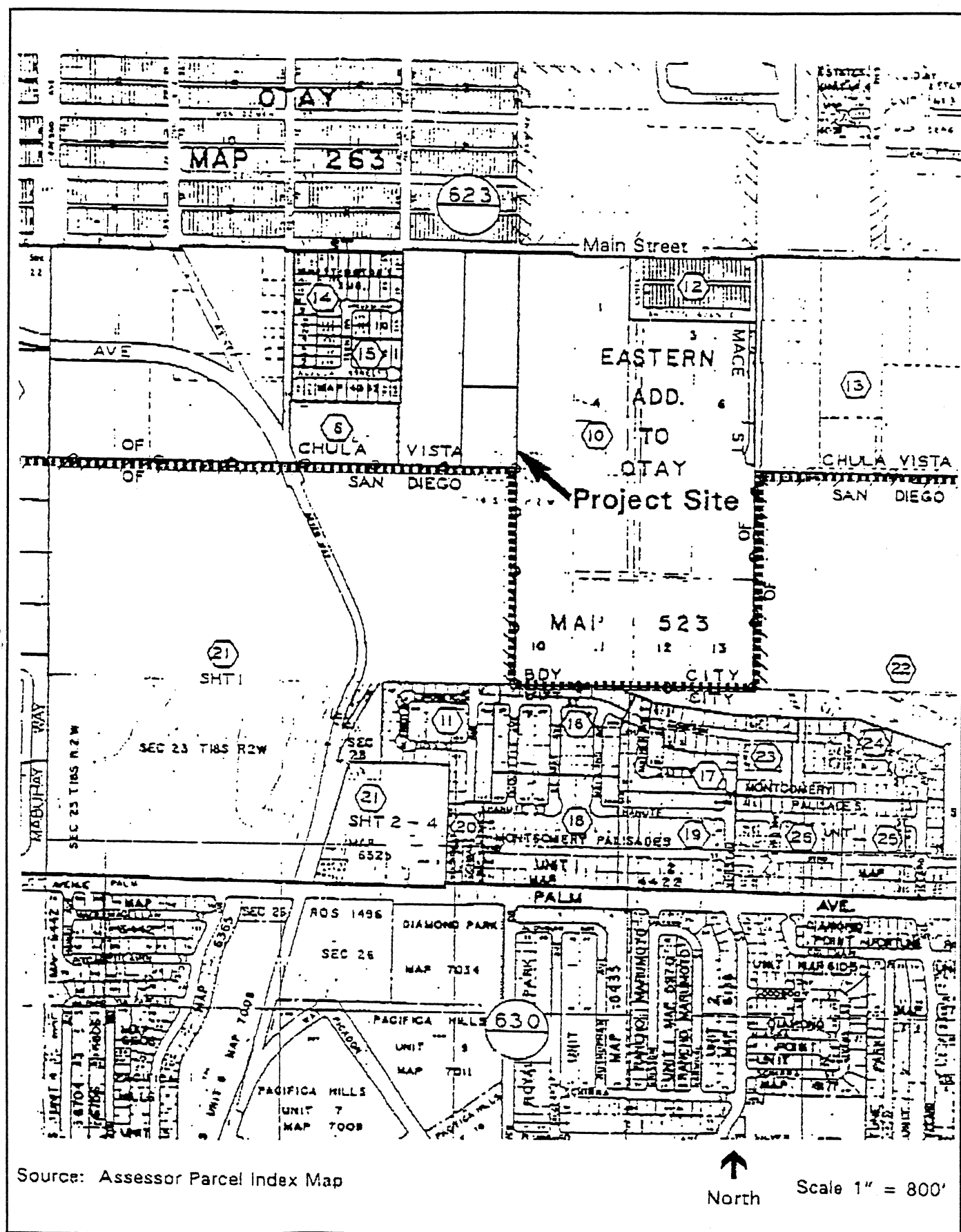

Douglas K. Eilar,
Principal

CT:elm

11.0 REFERENCES

1. City of Chula Vista Noise Ordinance
2. City of Chula Vista Element to the General Plan
3. City of Chula Vista MSCP Subarea Plan
4. City of San Diego Noise Ordinance
5. California Department of Transportation, *SOUND 32* Traffic Noise Model.

Wyle Laboratories, *Development of Ground Transportation Systems Noise Contours for the San Diego Region*, December, 1973.



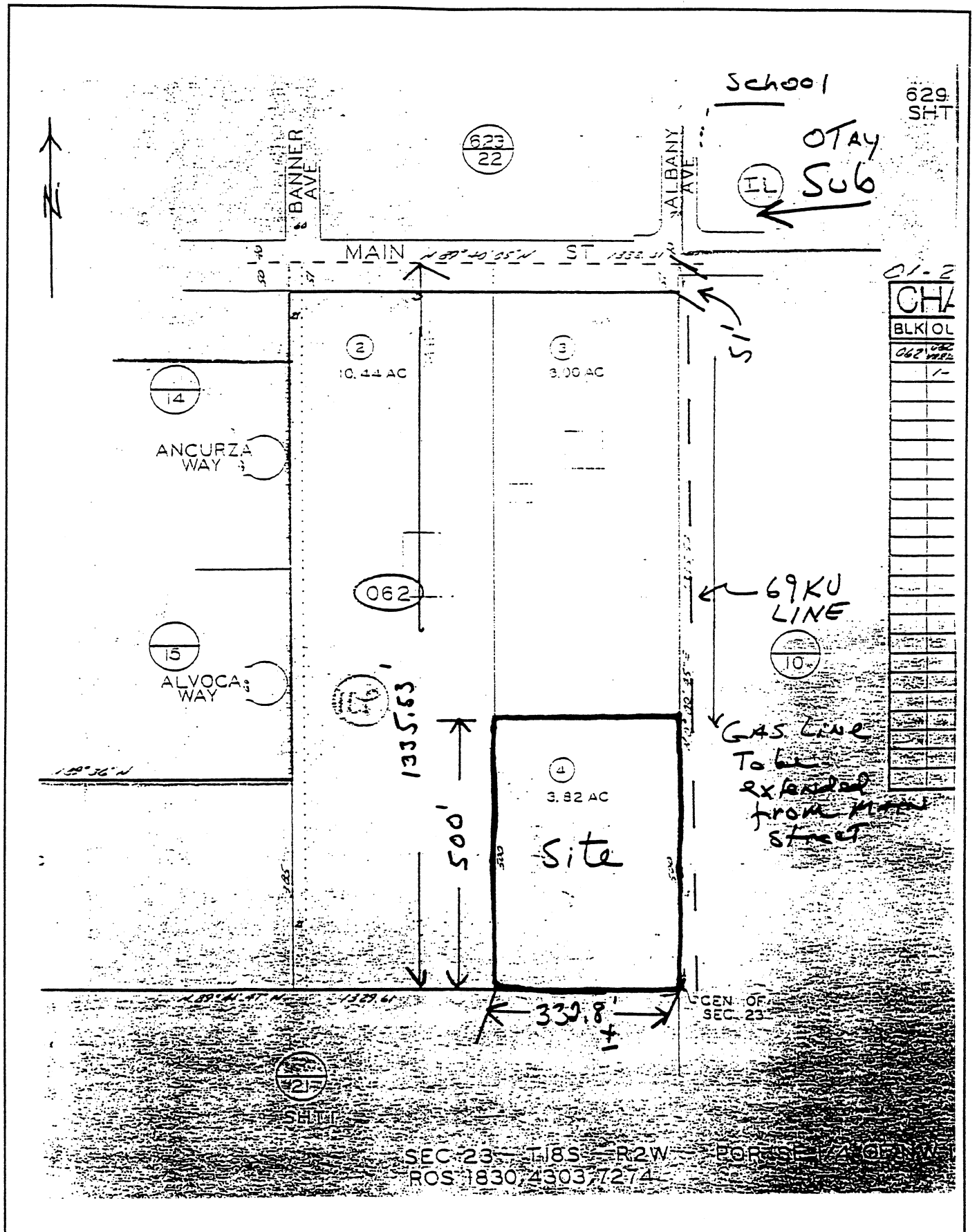


Figure 2. Assessor's Plat Map (reduced)
Scale: 1" = 250'

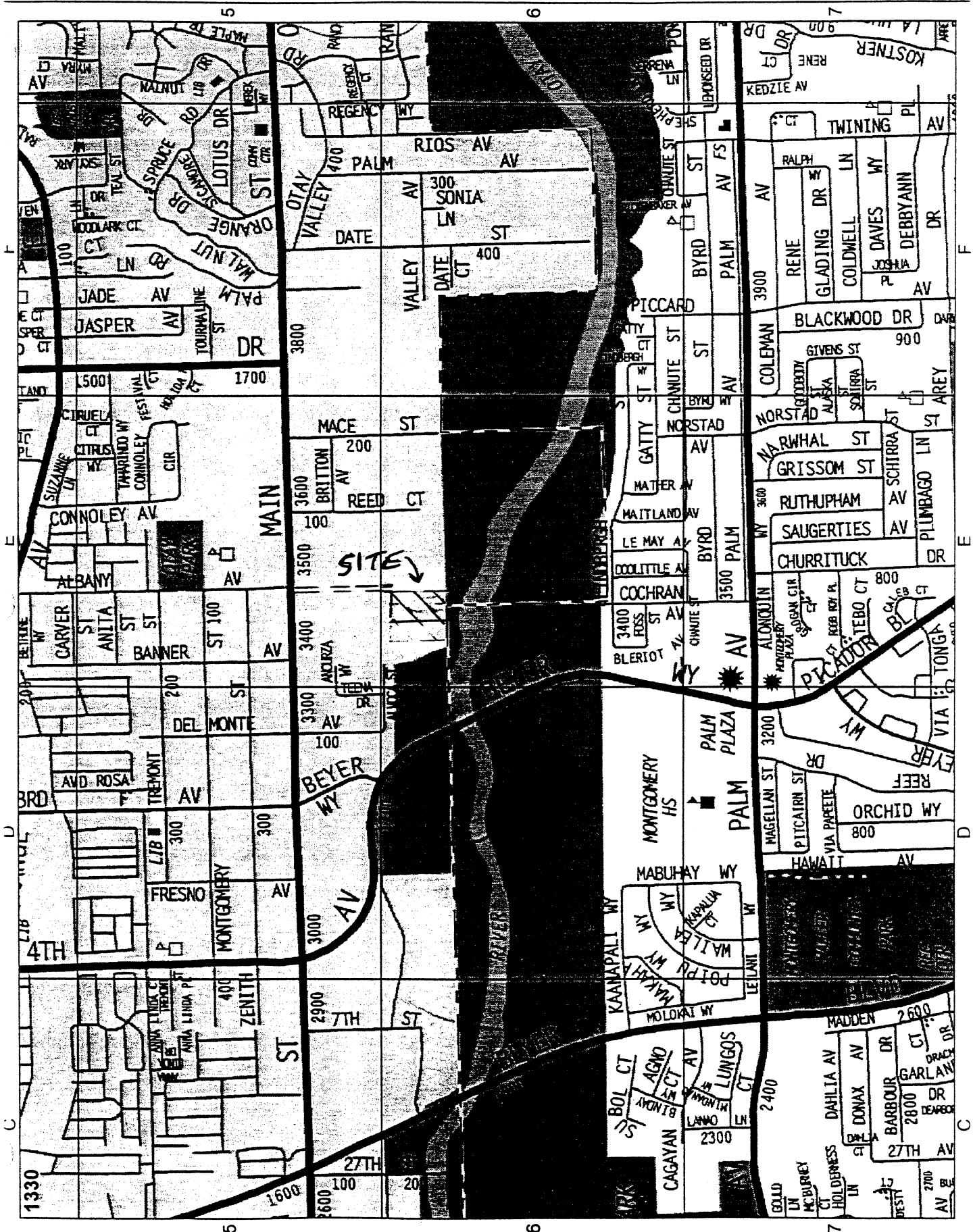


Figure 3. Area Map
Scale: 1" = 1200'

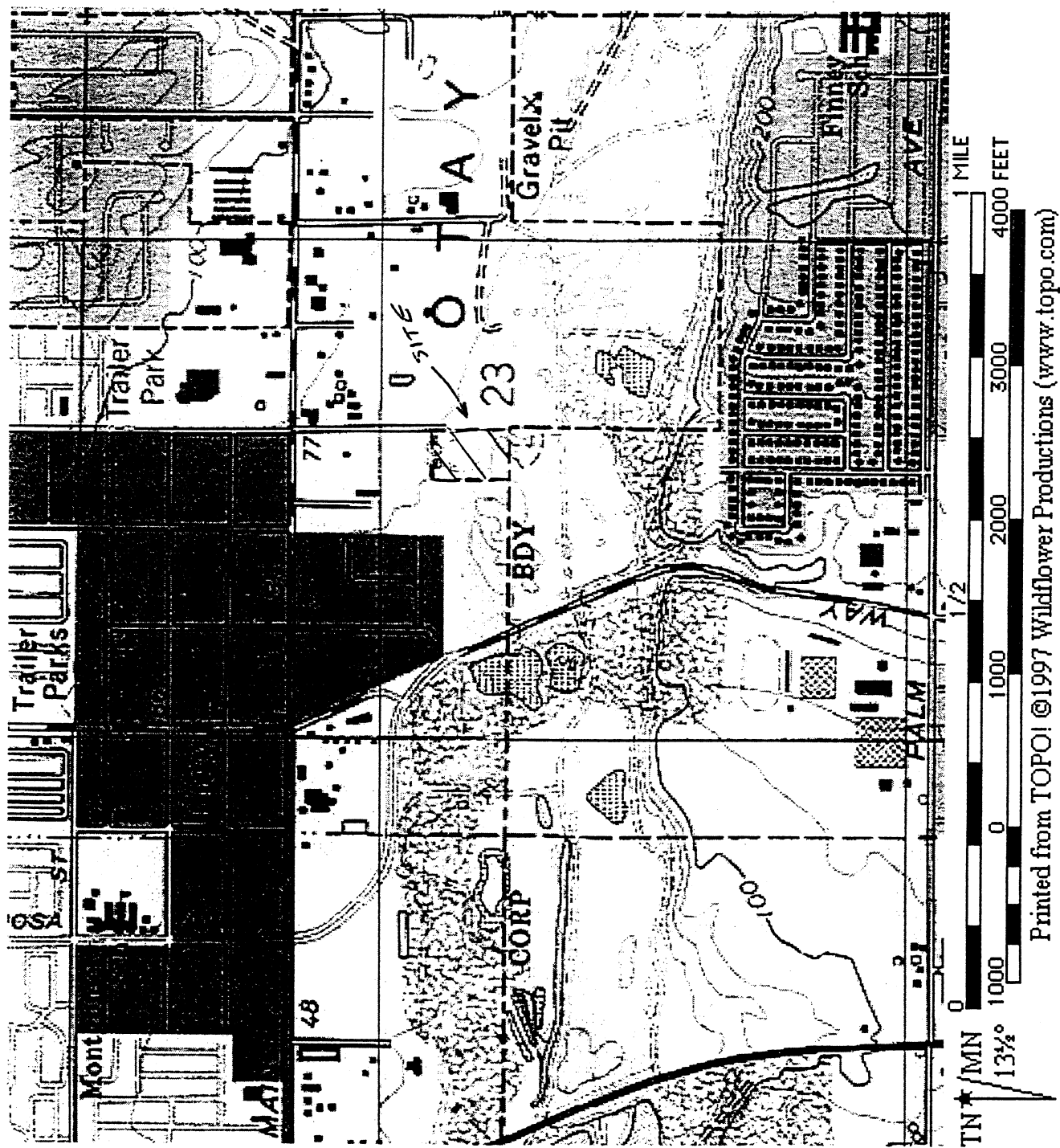


Figure 4. Portion of U.S.G.S. Topographic Map
Scale: 1" = 1000'



Figure 5. Satellite Photograph of Neighborhood
Scale: 1" = 330'

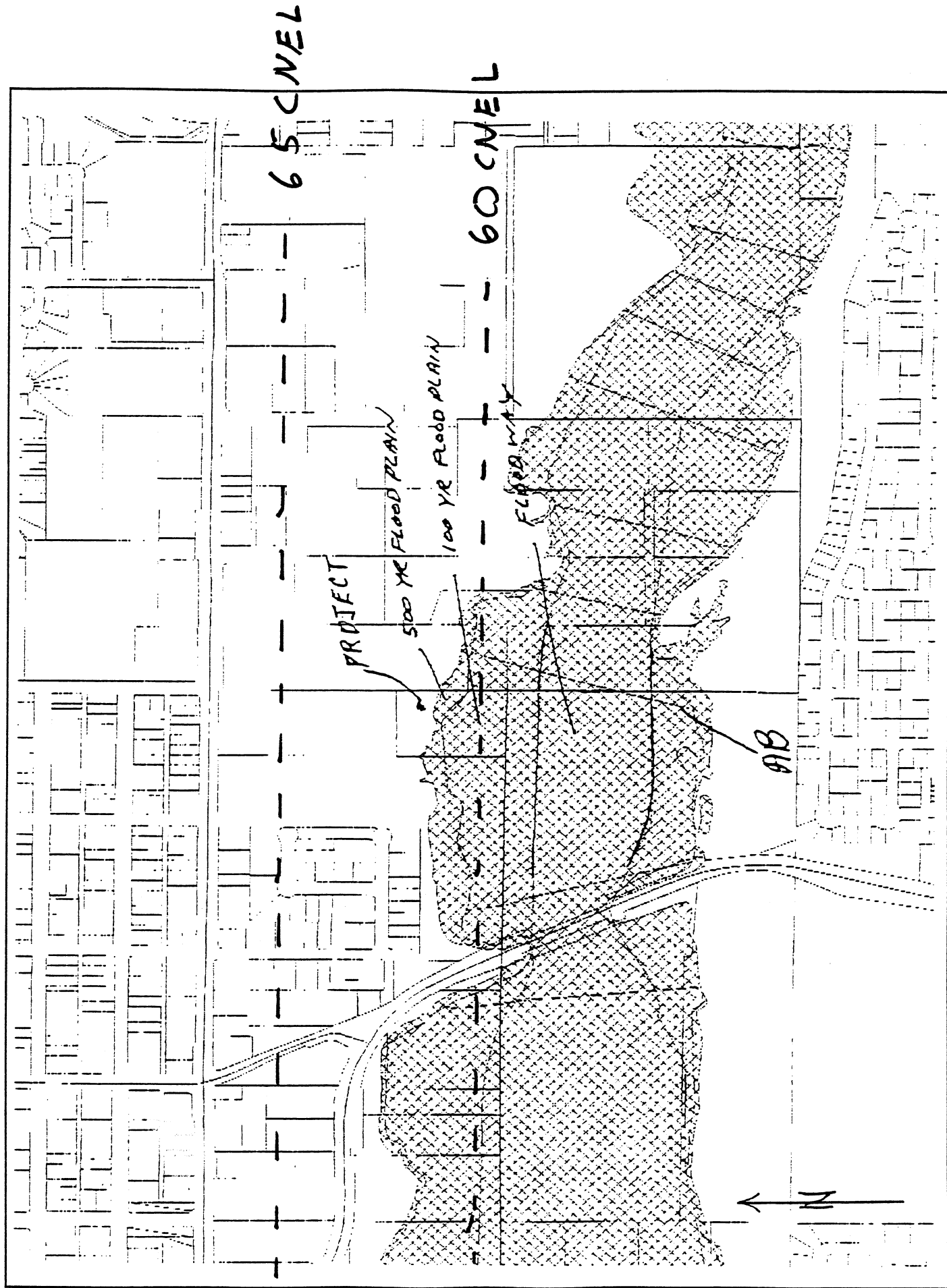
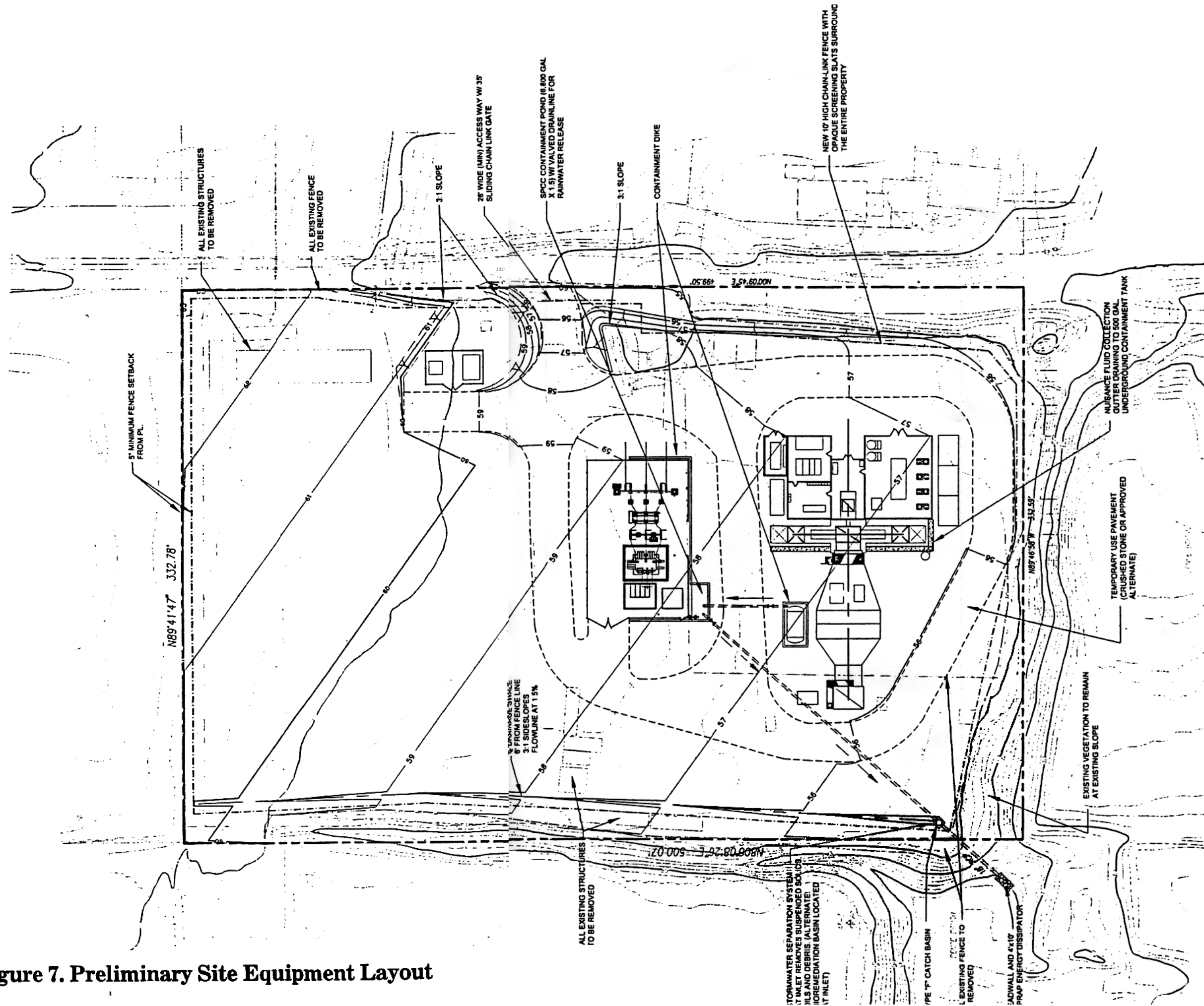
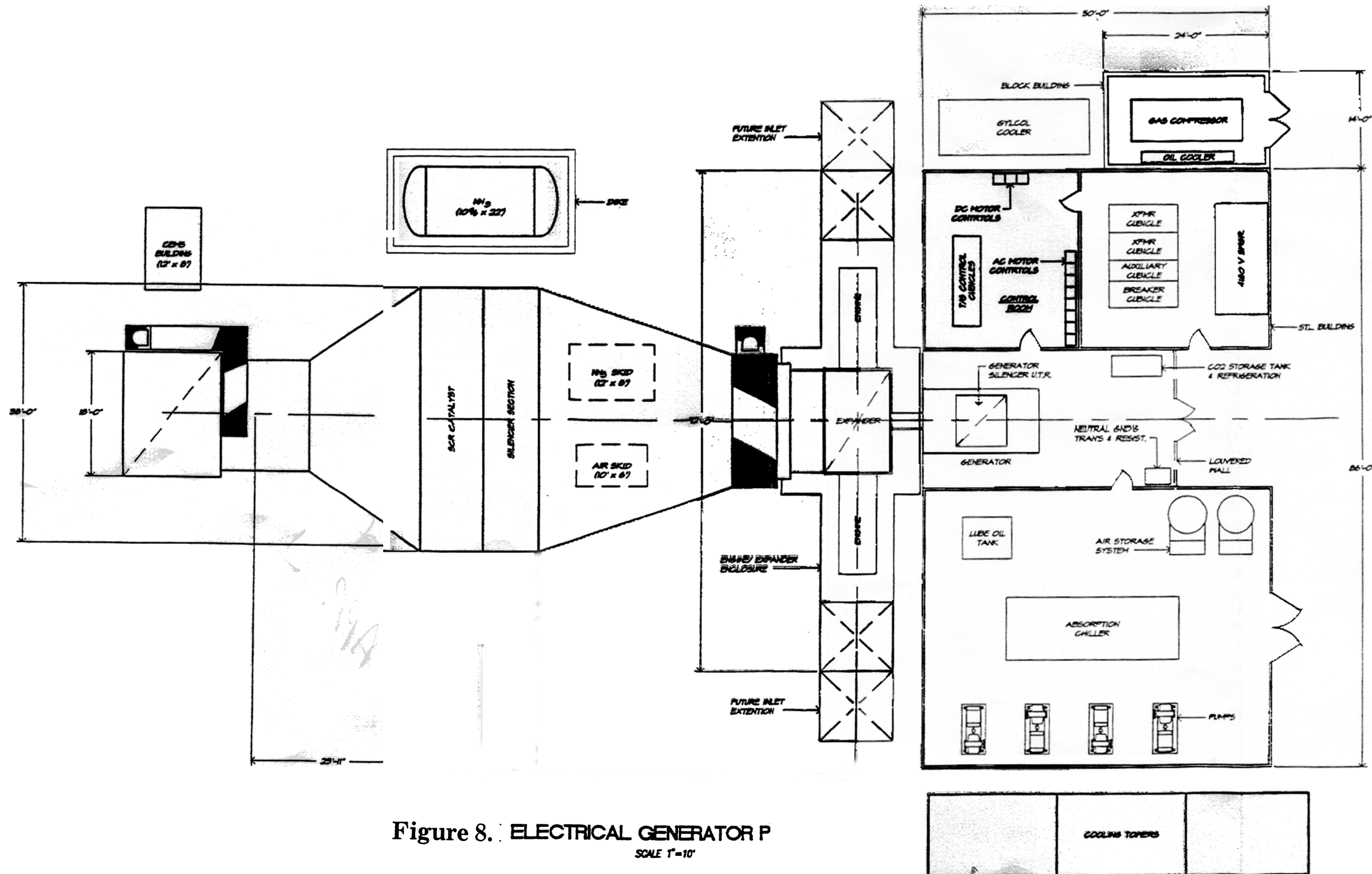


Figure 6. Flood Plain Boundaries
No Scale

Figure 7. Preliminary Site Equipment Layout





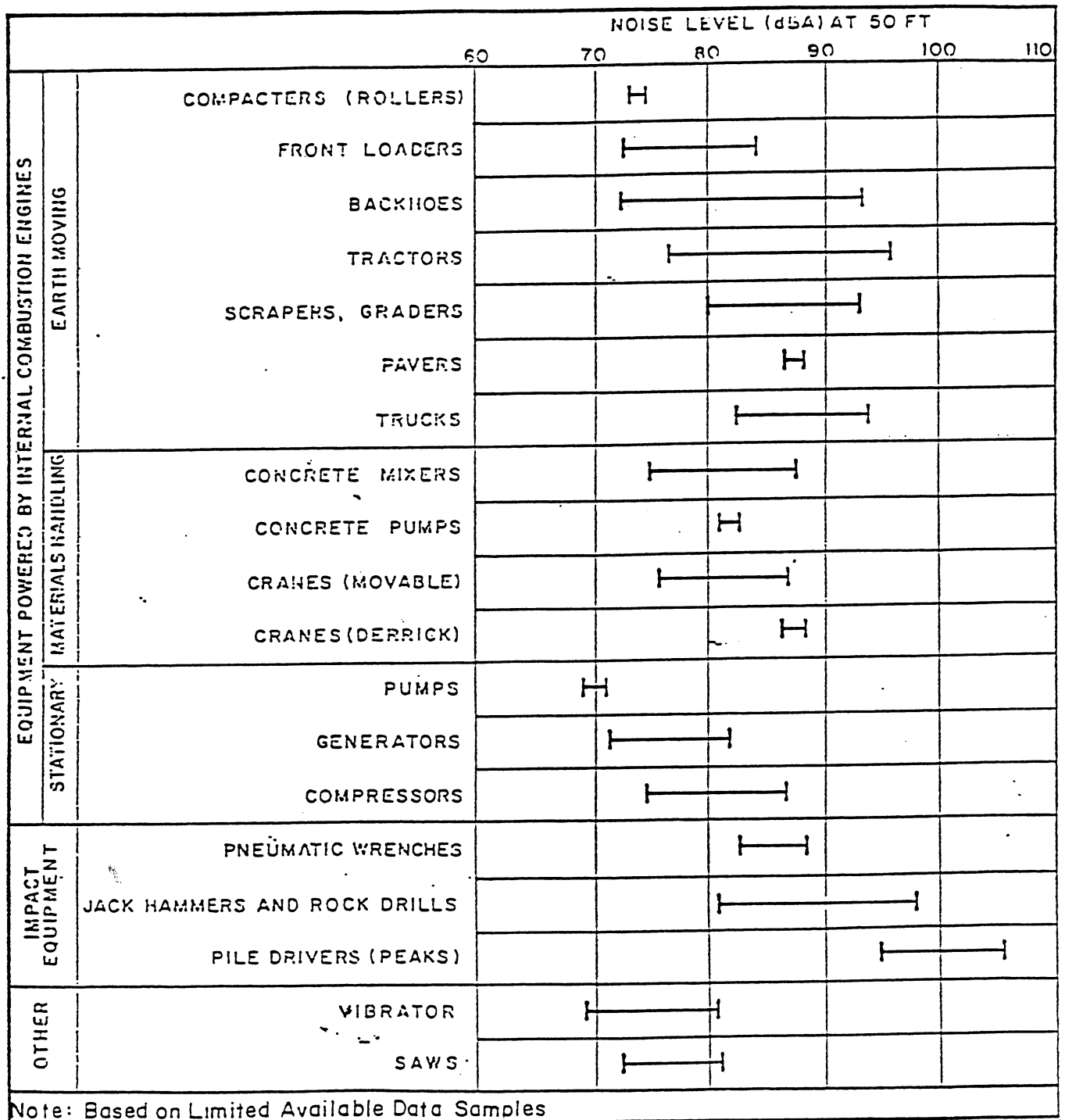


Figure 9. Construction Equipment Noise Levels

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Robert P Alvarado
Brenda R Yee
Joseph G. D'Angelo
Eric A Yee
Joe Blackburn
Todd McLaughlin
Brian M. Brustad
Claudia Kraehe
Jessica Johnston
Michael P. Listak
Kevin Frye
Marion G Miles
Merve D Noordzee
Rayko Kurosaki

Dear Mr. Mesple:

As you are aware, our firm has been actively working with your construction contractor (PG&E Dispersed Generating Company LLC) satisfy the acoustical conditions set forth by the City of Chula Vista in their permit for the power plant at the subject site. The first power plant (Chula Vista I or Unit 1) is presently under construction and is slated to commence generating power this year.

RAMCO, Inc has applied to construct a second power plant (Chula Vista II or Unit 2) at the same site.

You have raised some issues about potential environmental noise arising from the construction and operation of Unit 2. These issues are summarized in the three questions below.¹

QUESTIONS

- 1) Are the acoustical conditions contained in the existing Mitigation Monitoring and Reporting Program (MMRP)² for Unit 1 appropriate for Unit 2?

¹ Refer to the Appendix for a discussion of the historical background leading to the establishment of acoustical conditions for Unit 1.

² One objective in the MMRP document for Unit 1 is to achieve an A-weighted noise level of 60 decibels at the southern property line. Refer to the Appendix for more details.

- 2) Can the existing "sound wall" (noise barrier) employed for Unit 1 be used to help control construction noise from Unit 2?
- 3) Will the design for Unit 2 incorporate noise control devices sufficient to attain the 60-decibel property line limit if both units are operating?

RESPONSES

- 1) The acoustical conditions established for Unit 1 are appropriate for Unit 2 since the closest noise-sensitive receiver for both Units is the habitat preserve located adjacent to Unit 1 on its southern property line.
- 2) The noise barrier for Unit 1 provides protection for the habitat preserve by shielding noise caused by onsite construction vehicles and operations. If the noise barrier were extended northward along the western property line, the same barrier would also shield the habitat preserve from noise caused by operations at Unit 1.
- 3) Unit 1 and Unit 2 are different models from the same class of turbine power systems. Since both models have similar acoustical characteristics, the noise mitigation concepts developed for Unit 1 would also be appropriate for use with Unit 2. When both [mitigated] Units are operating, the contribution of Unit 2 to the property line noise level should be in the range of zero to three decibels. Most likely, the actual increase in noise will be unnoticeable since Unit 2 is further away from the southern property line than is Unit 1.

This completes our discussion of the acoustical issues regarding the proposed Unit 2 at the subject power plant project. If you have any questions or comments, please call me at extension 225.

Very Truly Yours,

CHARLES M. SALTER ASSOCIATES, INC.



Anthony P. Nash, P.E.
Vice President

APN/apn
PG&EUnit2NoiseLetterRev2
10May2001

Encl: Appendix

APPENDIX
Chula Vista Power Plant – Unit 2

BACKGROUND

Both power plant Units will be located on a site near the intersection of Albany and Main Streets in Chula Vista, a city 10 miles south of the city center for San Diego. Each Unit is a gas turbine-based system rated at approximately 50 mW.³ The project site is zoned light industrial and was formerly used as a storage lot for automobiles. There are no critical land use categories within 500 feet of the site; however, a biologist has determined that certain sensitive bird species nest immediately to the south in the Otay river valley. The City of San Diego holds this valley in trust as part of a Multiple Habitat Planning Area; a conceptual plan has also been prepared for its designation as a regional park.

The southern property line of the site represents a legal boundary between the City of Chula Vista proper and the subarea (i.e., a habitat preserve) that is managed by Chula Vista as part of a Multiple Species Conservation Program (MSCP).

The special use permit for Unit 1 contained a Mitigation Monitoring and Reporting Program that established limits for operational noise at the property line.⁴ The property line limit in the MMRP is an A-weighted noise level of 60 decibels.⁵ In the same document, construction noise is also addressed; however, in lieu of a numerical noise limit, there is an explicit requirement for noise barriers to be installed at the property line.

The conditions for Unit 1 included a requirement that a noise report be submitted to the City of Chula Vista in order to obtain a permit for construction. This report has already been submitted and was approved prior to issuing a permit for constructing Unit 1. The conditions also required that the operating plant be tested for noise emissions prior to use.

³ Unit 1 is 44 mW and Unit 2 is 62 mW.

⁴ These conditions were established as part of a Mitigated Negative Declaration, *IS-00-39*. This document sets forth the mitigation conditions for Special Use Permit SUPS-00-08. In *IS-00-39*, noise is one of the "environmental factors potentially affected" by the project. This particular environmental factor in *IS-00-39* is addressed by an agreement between the City and the applicant to implement a "Mitigation Monitoring and Reporting Program". This program is abbreviated as the MMRP and contains several mitigation measures that place restrictions on noise emitted from the power plant site.

⁵ **A-Weighted Sound Level (Noise Level)** — The term for the A-weighted sound pressure level. It is obtained by use of a standard sound level meter and is expressed in decibels (dB). Sometimes the unit of sound level is written as dB(A). A-weighting is a standard frequency weighting that is commonly employed to measure the loudness or "noisiness" of sounds. A 10 dB-increase in sound level is perceived by people to be twice as loud. All noise levels in this letter are A-weighted.

APPENDIX (CONTINUED)
Chula Vista Power Plant – Unit 2

Another one of the acoustical conditions for Unit 1 involved the installation of a construction noise barrier so the property line noise limit (from either construction or plant operation) would not be exceeded between 15 February and 15 August. This period is considered the approximate mating season for the *least Bell's vireo*, a bird subspecies that is officially listed as endangered. During the spring and summer months, the *least Bell's vireo* could potentially nest in the riparian habitat adjacent to the southern property line of the power plant.

CONSTRUCTION NOISE

Construction activities at the site will probably consist of a number of intermittent operations, i.e., onsite construction equipment will be used by the contractor on as needed basis to hoist, pump, or otherwise handle construction materials.⁶

The height of the engine-powered construction equipment will be approximately 10 feet above grade. This means that a property line noise barrier will help control noise transmission from the site to adjacent land uses.⁷

The construction noise barriers are not acoustically effective for controlling the noise of operations at elevations more than 15 feet above grade. Therefore, after 15 February, construction operations at the top of the SCR structure⁸ would be limited to welding and bolting with conventional tooling (i.e., no impact wrenches).

The required noise barrier is presently installed along the entire southern property line and along a portion of the western property line. (The noise barrier does not yet protect the northern portion of the site that is slated for Unit 2). Once the plant is operational, this temporary construction noise barrier could be removed and replaced with a permanent property line fence⁹ consisting of either a solid material or an open "chain-link" construction.

— End —

⁶ In addition, the owner's representative will help ensure that the construction vehicles are maintained in good repair to help control their noise emissions.

⁷ According to the MMRP for Unit 1, mitigation measure No. 1 stipulates that the noise barrier is to be in place prior to 15 February 2001.

⁸ SCR is an abbreviation for the Selective Catalytic Reduction system that helps control emissions from the plant's exhaust stack. The SCR also includes acoustical duct silencers to help reduce exhaust noise.

⁹ The permanent fence is intended to satisfy mitigation measure No. 2 in the MMRP for Unit 1.

**CHULA VISTA POWER PLANT
NOISE REPORT**

CHULA VISTA, CA

CSA Project No: 00-476

Prepared for:

City of Chula Vista
Redevelopment Agency
276 Fourth Avenue
Chula Vista, CA 91910

Prepared by:

Anthony Nash, P.E.
Vice President

7 December 2000

1) INTRODUCTION

This report is provided as part of an environmental impact mitigation program for a power plant proposed by PG&E Dispersed Generating Company, LLC (abbreviated PG&E DG). The company has applied to construct the plant in the City of Chula Vista, California. The City has granted a special use permit on the condition that certain measures are fulfilled as established in the City's "Mitigated Negative Declaration". One class of these mitigation measures pertains to noise emissions from the plant.

This report addresses the power plant noise emissions and their mitigation. The report is divided into the following sections.

- 1) Introduction
- 2) Executive Summary
- 3) Background
- 4) Noise Criteria
- 5) Sources of Operational Noise
- 6) Mitigation of Operational Noise
- 7) Sources and Mitigation of Construction Noise

Appendix I	Noise Ordinance Compliance	[one page]
Appendix II	References	[one page]
Appendix III	MMRP Conditions	[three pages]

2) EXECUTIVE SUMMARY

- The proposed power plant is adjacent to a wildlife preserve that contains noise-sensitive birds
- The City has required that the plant limit its property line A-weighted noise level to 60 decibels
- There are a number of noise sources for the power plant that require mitigation in order to meet the noise limit
- The applicant is required to prepare an acoustical analysis prior to the City issuing a permit for constructing the power plant
- The various noise sources for the power plant are addressed within this report
- After construction, the City requires an acoustical test to determine the noise level of the power plant at the property line

3) BACKGROUND

The subject project is a 50 mW gas turbine-based power plant that will be located on a site near the intersection of Albany and Main Streets in Chula Vista, a city 10 miles south of the city center for San Diego. The project site is zoned light industrial and was formerly used as a storage lot for automobiles. There are no critical land use categories within 500 feet of the site; however, a biologist has determined that certain sensitive bird species nest immediately to the south in the Otay river valley. The City of San Diego holds this valley in trust as part of a Multiple Habitat Planning Area; a conceptual plan has also been prepared for its designation as a regional park.

The southern boundary of the power plant site represents a legal boundary between the City of Chula Vista proper and the subarea (i.e., a preserve) that is managed by Chula Vista as part of a Multiple Species Conservation Program (MSCP).

The special use permit for the power plant now contains a Mitigation Monitoring and Reporting Program (MMRP) that establishes limits for operational noise at the property line. In the same document, construction noise is also addressed; however, in lieu of a numerical noise limit, there is an explicit requirement for noise barriers to be installed at the property line.

The conditions include a requirement that a noise report be prepared prior to the City issuing a permit for construction. The conditions also require that the operating plant be tested for noise emissions prior to use.

This document is intended to fulfill the City's specific requirement for preparing a noise report.

4) NOISE CRITERIA

Project-Specific Conditions

The formal plan¹ for managing the MSCP subarea addresses noise emissions from adjacent land uses that could potentially affect sensitive bird species. Specifically, the plan recommends that the noise level at the subarea boundary should not exceed a CNEL² of 60 decibels during the breeding season of the *Least Bell's Vireo*.³

As part of the conditions in the special use permit for PG&E DG, noise emissions from the project are limited at the property line. The limit stated in the MMRP is an A-weighted noise level of 60 decibels⁴. The MMRP noise limit applies only to the spring and summer — i.e., a time frame from 15 February to 15 August, inclusively.

General Conditions

The City of Chula Vista has adopted a noise element as part of its general plan. Both the City of Chula Vista and San Diego have also adopted noise ordinances with objective noise limits. The various guidelines and noise limits in these documents are summarized in Appendix I in this report.

¹ *City of Chula Vista Multiple Species Conservation Program (MSCP) Subarea Plan*, Section 6.3.2, *Adjacency Management Issues*, Priority 1, paragraph 3(e), "Noise" (page 151) in draft document prepared by MNA Consulting on 11 September 2000. Formally adopted October 2000

² CNEL (Community Noise Equivalent Level) - A term for the 24-hour average A-weighted noise level (see definition of A-weighting, below). Penalties are added to the evening (+5) and nighttime (+10) hourly noise levels prior to averaging with the daytime hourly noise levels. The penalties are intended to account for increased sensitivity of people to noise at night.

A-Weighted Sound Level (Noise Level) - The term for the A-weighted sound pressure level. It is obtained by use of a standard sound level meter and is expressed in decibels (dB). Sometimes the unit of sound level is written as dB(A). A-weighting is a standard frequency weighting that is commonly employed to measure the loudness or "noisiness" of sounds. A 10 dB-increase in sound level is perceived by people to be twice as loud.

³ In his environmental report, the biologist for the subject project identified the *Least Bell's Vireo* in the subarea and went on to recommend establishing a noise limit at the property line during the breeding season (15 March to 15 September). The limit suggested by the biologist was an A-weighted hourly average noise level of 60 decibels.

⁴ When discussing the noise limit there is no explicit averaging time mentioned in the MMRP; by implication, the MMRP presumes that the noise emitted from the project is steady and constant.

From a noise control standpoint, the property line noise limit contained in the conditions for this project represents the most stringent of all the noise criteria. For this reason, the noise mitigation techniques required to satisfy the property line noise limit would simultaneously satisfy all the other relevant noise criteria.

5) SOURCES OF OPERATIONAL NOISE

Plant Description

The power plant includes two Pratt & Whitney gas turbines arranged so their axes are in a single line with the exhausts both facing into a common chamber. This arrangement is called a “Twin-Pak”. The gas turbine is called a “gas generator” and the common chamber is the “expander”. The “expander” contains another turbine that rotates an electrical generator whose axis is 90 degrees to the gas generator axis. The exhaust gases from the expander are fed upward through a radiused elbow into a large horizontal diverging exhaust duct called an SCR⁵. The exhaust stream within the SCR first passes through acoustical duct silencers and then into a catalytic converter to eliminate nitrogen oxide pollutants. The cleansed exhaust stream is then discharged upward through a large exhaust stack to the atmosphere.

The power plant operates on natural gas obtained from a local pipeline. Prior to its combustion in the gas generator, the pressure of the natural gas is increased substantially by an onsite 1000 hp multi-stage, reciprocating compressor. The compressor is installed on a skid along with a fan-powered dry-type intercooler to cool the natural gas between stages of compression.⁶

The power plant will generally operate only during the daytime hours (typically from 11 am to 6 pm. On rare occasions, these operating hours may be extended from 7 am to 7 pm.

⁵ The power plant exhaust system includes both acoustical duct silencers and an exhaust gas treatment device (a “catalytic converter”) that is used to selectively eliminate certain air pollutants. In the context of this report, the entire exhaust system will be referred to as the Selective Catalytic Reduction system (abbreviated “SCR”).

⁶ In the latest design concept for the subject power plant, there will be neither chillers nor high-volume air blowers as described in the MMRP conditions prepared in June 2000.

Noise Sources

The principal sources of noise emissions are:

- The gas generator and associated cooling air inlets
- Radiation from the wall of the expander section
- Radiation from the wall of the radiused elbow
- Radiation from the wall of the SCR
- The SCR exhaust stack (downstream of the duct silencers)
- The 1000 hp gas compressor
- Other miscellaneous pumps and fans

6) MITIGATION OF OPERATIONAL NOISE

The combustion air inlet for the gas generator will be treated with silencers to control the intense tonal noise emanating from the axial compressor. The combustion air inlet will be oriented vertically enabling the entire 90-degree elbow to be treated with sound-absorbing material. This technique is extremely effective for attenuating the compressor tone that is known to occur between 2000 and 4000 hertz.

In addition, the entire inlet ductwork and elbow will be covered with a double-wall metal enclosure so the tonal noise within the inlet duct cannot escape through the duct wall.

The gas generators (i.e., gas turbines) themselves will be housed in a double-walled enclosure that also permits a flow of cooling air around the gas generator. A separate forced air fan will furnish this cooling air supply. The inlet air for the large cooling fan is routed through the same silencer that serves to attenuate inlet noise for the gas generator. This technique will control fan noise so it is not transmitted to the property line.

The air exhaust from the cooling fan will be routed past the gas generators and then through an exhaust silencer. The cooling fan exhaust silencer will also control the noise that is radiated from the casing of the gas generator itself. Thus, the radiated noise from the gas generator will be treated prior to entering the atmosphere.

The same cooling air will be directed across the surfaces of the expander section to help cool this component. The expander section will be housed in a complete metal enclosure that guides the cooling air around the hot wall of the expander. A separate metal building will contain the electrical generator so the heat from the expander does not degrade the performance of the electrical generator.

The radiused elbow and a portion of the SCR will be covered by a series of acoustical panels that are spaced away from the noise-radiating surfaces.⁷ The acoustical panels are of a four-inch thick, double-wall construction and have sound-absorbing material between their two surfaces. The three-foot airspace between the acoustical panels and the surfaces of the radiused elbow and SCR will be extremely effective for controlling low frequency noise radiation.

The exhaust silencers within the SCR presently have an active (sound-attenuating) length of 14 feet. There is additional space within the SCR to install an additional eight feet of active silencer length.

At present, it is fairly certain that there will be sufficient attenuation of the noisy exhaust stream through a combination of the duct silencer and the catalytic device within the SCR. In case the estimates of acoustical attenuation within the SCR system prove insufficient, more silencers can be installed in the additional space available.

The 1000-hp natural gas compressor will be installed in a metal or concrete/masonry enclosure having a “roof” of duct silencers. This concept provides sufficient noise attenuation while allowing the compressor to be exposed to the open atmosphere, as required in the State Building Code.

Acoustical Tests

Once the construction of the power plant has been completed, noise monitoring will be performed for the operating plant to verify whether the property line noise limit has been attained. This noise monitoring process will be coordinated with the City of Chula Vista to comply with condition No. 2 of the MMRP.

⁷ In the “worst case” analysis, the acoustical panels may need to cover the entire exterior of the SCR from the radiused elbow up to the location of the exhaust silencers.

Calibrated noise measurements will be conducted at several locations along the property line using a Type 1 (precision) sound level meter. The A-weighted noise level will be obtained and reported on a plan showing the measurement locations.

Further Mitigation

If the noise limit is exceeded, further noise control features will be implemented. These will include one or more of the following:

- Additional exhaust silencers in the SCR
- Additional acoustical panels external to the SCR
- Modifications to the existing acoustical enclosures for the gas generators and expander
- Revisions and/or additions to property line noise barriers

7) SOURCES AND MITIGATION OF CONSTRUCTION NOISE

The construction of the power plant involves grading, constructing foundations, transport and erection of steel framing, plus installation of equipment. Most of the noise generation will arise from trucks and machines powered by diesel engines. During the latter portions of the project, the SCR structure will be erected using a crane. This erection phase will involve welding and bolting; some of these operations will be performed at 40 feet above grade.

The height of the engine-powered construction equipment will be approximately 10 feet above grade. This means that a property line noise barrier will help control noise transmission from the site to adjacent land uses.⁸

The construction noise barriers are not acoustically effective for controlling the noise of operations at elevations more than 15 feet above grade. Therefore, after 15 February, construction operations at the top of the SCR structure would be limited to welding and bolting with conventional tooling (i.e., no impact wrenches).

Noise Barrier Design Concept

The construction noise barrier should be 12 to 14 feet tall and extend across the entire south side of the site (a distance of 300 feet). The noise barrier should continue on the west side to a point 150 feet north of the southwest corner of the site. The barrier should also extend approximately 100 feet on the east side of the site to a point where construction vehicles could enter from the access road at the northeast corner of the site.

The construction noise barrier could be assembled from tongue-and groove plywood panels weighing at least 3 lbs/ft² (e.g., at least 1.125 inches thick). The panels could be braced using diagonal stiffeners and even supported on a foundation, if required. It is important that no cracks or gaps are left around the three sides of the barrier panels; joints should be covered with battens or caulked airtight.

The noise barrier will be installed at the present location of the "chain-link" fence that surrounds the site. Once the plant is operational, this temporary construction noise barrier can be removed and replaced with a permanent property line fence consisting of either a solid material or an open "chain-link" construction. The latter will satisfy mitigation measure No. 2 in the MMRP.

The owner's representative will help ensure that the construction vehicles are maintained in good repair to help control their noise emissions. There will also be spot monitoring of noise levels

⁸ According to condition No. 1 in the MMRP, the noise barrier needs to be installed prior to 15 February 2001.

during the construction process. These steps are intended to comply with condition No. 5 in the MMRP.

APPENDIX I**NOISE ORDINANCE COMPLIANCE**

The City noise ordinances applicable to the subject project are shown below:

City of Chula Vista Noise Ordinance

(Chapter 19.04, paragraph 19.68.030 of the Municipal Code)

One-hour Average A-weighted Sound Level, decibels

Property Line Limits:

All Residential Classifications:

Daytime & Evening (weekdays) (7 am to 10 pm)	50
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Light Industrial Classification:

Daytime & Evening (7 am to 10 pm)	70
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City of San Diego Noise Ordinance

(Municipal Code Section 59.5.0401)

One-hour Average A-weighted Sound Level, decibels

Property Line Limits:

Residential (R-1):

Daytime (7 am to 7 pm)	50
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Evening (7 am to 10 pm)	45
-------------------------	-----------

The closest light industrial site is located immediately west and east of the power plant site; the closest residential property is located about 500 feet to the west. Assuming the noise emission from the proposed power plant is 60 decibels at the plant's property line, the light industrial category of the Chula Vista Noise Ordinance is satisfied.

The estimated power plant noise level at the closest residential property will be less than 45 decibels; therefore, the power plant noise level satisfies the most stringent category from either noise ordinance.

This same finding also applies to the residential dwellings located 1300 feet to the south of the power plant, across the Otay river valley. Here, the estimated noise level from the power plant will be less than 40 decibels.¹

These projected noise level estimates are based on normal meteorological conditions. The local noise level could increase somewhat at these distant locations if the power plant were operated in the late evening. This increase can be caused by inversion layers or nighttime cooling in the atmosphere. The possibility of such a phenomenon is unlikely, given the fact that the plant will usually shut down by 7 pm.

[End of Appendix I]

¹ This residential neighborhood is elevated less than 200 feet above the power plant site. On 9 November 2000, the existing background noise level was measured at the residential property line directly opposite the power plant site. The measured A-weighted noise level was 50 decibels at 6 pm. The relatively constant noise was controlled by traffic noise on Beyer Way, a north-south arterial road located 1000 feet west of the measurement position.

APPENDIX II

REFERENCES

Noise Impact Analysis, Proposed PG&E Generating Facility [at] 3497 Main Street, Chula Vista, California, Job #A00411, Douglas Eilar & Associates, 24 May 2000

A Biological Resources Survey Report for The Proposed PG&E Power Generating Facility, [at] 3497 Main Street, Project #A00412, Vincent N. Scheidt, M.A., May 2000

Otay Valley Regional Park Concept Plan, City of Chula Vista, 21 February 1997

Multiple Species Conservation Program Subarea Plan, City of Chula Vista, 4 January 2000 (draft), adopted October 2000

Resolution Number 1699, Redevelopment Agency of the City of Chula Vista, adopted 26 September 2000

[Note: this resolution grants Special Use Permit SUPS-00-08 for the proposed power plant]

Mitigated Negative Declaration IS-00-39, 23 June 2000, revised 20 July 2000

[Note: this document establishes the mitigation conditions for Special Use Permit SUPS-00-08. In *IS-00-39*, noise is one of the “environmental factors potentially affected” by the project. This particular environmental factor in *IS-00-39* is addressed by an agreement between the City and the applicant to implement the “Mitigation Monitoring and Reporting Program” shown in Appendix III of this report]

APPENDIX III

**MITIGATION MEASURES INCLUDED IN
Mitigation Monitoring and Reporting Program**